

odes in the College lecture-room and escapes to the fascinating microscopes and dissecting troughs of Prof. Moseley, or the verniers and milligram-weighing pans of Prof. Clifton, is marked out for patronage. And not only indeed are Oxford and Cambridge students of science thus benefited.

The courses of instruction in scientific subjects given at the London Colleges, University and King's, are pre-eminently such as will enable a candidate to do justice to his abilities in this examination. The examination is practical, and no mere smattering of a subject will obtain any marks for a candidate. Hence the "crammers" are at a disadvantage, and the teachers in duly-organised and properly-furnished laboratories, are rightly encouraged in their efforts to carry on thorough courses of instruction. It is indeed, a matter for satisfaction that hitherto the various cramming establishments where young men are "prepared" for public examinations have failed to enable any candidate to gain a success in any branch of natural science in these higher competitive examinations, those candidates who have scored marks in natural science having been University students. We subjoin an extract from the Regulations issued by the Civil Service Commission, to the secretary of which body application for further information should be made.

1. The limits of age for these situations are 18 and 24, and candidates must be of the prescribed age on the first day of the competitive examination.

2. At the competitive examinations exercises will be set in the following subjects only; the maximum of marks for each subject being fixed as follows, viz. :—

	Marks.
English Composition (including Précis-writing) ...	500
History of England—including that of the Laws and Constitution ...	500
English Language and Literature ...	500
Language, Literature, and History of Greece ...	750
" " " Rome ...	750
" " " France ...	375
" " " Germany ...	375
" " " Italy ...	375
Mathematics (pure and mixed) ...	1250
Natural Science: that is, (1) Chemistry, including Heat; (2) Electricity and Magnetism; (3) Geology and Mineralogy; (4) Zoology; (5) Botany ...	1000
** The total (1000) marks may be obtained by adequate proficiency in any two or more of the five branches of science included under this head.	
Moral Sciences: that is, Logic, Mental and Moral Philosophy ...	500
Jurisprudence ...	375
Political Economy ...	375

Candidates will be at liberty to offer themselves for examination in any or all of these subjects. No subjects are obligatory.

No candidate will be allowed any marks in respect of any subject of examination unless he shall be considered to possess a *competent knowledge* of that subject.

NOTES

A TELEGRAM, dated December 21, has been received by the Finnish Academy of Sciences from Prof. S. Lemström, chief of the Finnish Meteorological Observatory at Sodankylä. He states that, having placed a galvanic battery with conductors covering an area of 900 square metres on the hill of Oratunturi, he found the cone to be generally surrounded by a halo, yellow-white in colour, which faintly but perfectly yields the spectrum of the aurora borealis. This, he states, furnishes a direct proof of the electrical nature of the aurora, and opens a new field in the study of the physical condition of the earth. A further telegram, dated Sodankylä, January 5, has been received, in which Prof. Lemström states that experiments with the aurora borealis made December 29, in Enare, near Kultala, on the

hill of Pietarintunturi, confirm the results of those at Oratunturi. On that date a straight beam of aurora was seen over the galvanic apparatus. It also appears from the magnetic observations that the terrestrial current ceases below the aurora arc, while the atmospheric current rapidly increases, but depends on the area of the galvanic apparatus to which it seems to be proportional. The Professor regrets that with the means at his disposal further experiments cannot be made, and that he intended, on the 13th inst., to withdraw the apparatus.

THE Report of the Royal Gardens, Kew, for 1881, shows what a large amount of varied and highly useful work is got through in the space of a year at that great national establishment; perhaps *imperial* would be more accurate than national, for it is really the botanical and horticultural centre of the whole empire. One important feature is the lessons given during the year to the young gardeners in the science of these subjects; this will certainly tend to secure that the work of the gardens throughout are conducted with intelligence and on a sound scientific basis. The Report contains extracts from the reports of various Colonial curators, on the progress of experiment in the culture of certain important plants, such as Cinchona and india-rubber. Mr. Jamieson reports from the Nilgiris that he has found the Cape Coast and Liberian coffee-plants to be really two varieties. Queensland may yet add coffee to its other industries, a vastly important addition. The Report contains an illustration of *Cinchona Ledgeriana*, Moens.

In preparation for the International Fisheries Exhibition there is a large number of artificers now employed in erecting and completing enormous buildings for the reception of the exhibits on the ground known as the Royal Horticultural Gardens, South Kensington. Some four or five immense structures have been already erected, two standing side by side on the western side of the gardens—one being about 180 yards, the other some 140 yards in length, with a width of about 20 yards, and of great height and capacity. Arched roofs contain in the centre, running the whole length of the building, a wide breadth of glass, which throws below as ample an amount of light as can be desired. Other similar buildings are in the course of completion at the north-eastern corner of the gardens, close to the Albert Hall; and when the capacity of all these structures is considered, some estimate can be formed of the enormous proportions the International Exhibition will assume. The arcade at the south-western side of the gardens, well known for the horticultural and other expositions which the Royal Horticultural Society has held in it, is being devoted to the purposes of an aquarium, which will soon be completed, and in which both fresh-water and sea fish will be exhibited. The spacious long arcade affords ample room for all the tanks that may be required, and it is expected that the aquarium will form one of the most attractive features of the exhibition. Arrangements will be made to provide easy access from one building to another, and such portions of the gardens as remain uncovered by the necessary structures will serve as an agreeable promenade. All the works are so forward that everything will be ready in good time for the reception of the exhibits of our own and of foreign countries.

CONSIDERABLE success has attended the Sunday Evening Association, its object being to bring together all persons who, estimating highly the elevating influence of music, the sister arts, literature and science, desire, by means of meetings on Sunday evenings, to see them more fully identified with the religious life of the people. The president is Dr. Geo. J. Romanes, F.R.S. The fifth series of meetings will be concluded next Sunday with a lecture by Dr. W. B. Carpenter, F.R.S., C.B., on "Niagara." A sixth series will be commenced on Sunday, February 11, and will include lectures by Dr. G. J. Romanes, F.R.S., on "Star

Fish; " J. Cotter Morison, M.A., on "A Glimpse of England in the Fifteenth Century;" Dr. P. Martin Duncan, F.R.S., on "Metamorphosis of Insects," and J. Norman Lockyer, F.R.S., on "The Recent Eclipse of the Sun." The meetings are held in the Working Men's College, Great Ormond Street.

THE Report of the Commissioner of the Imperial Japanese Mint, Ōsaka, for the year ending June, 1882, being the twelfth report of the Japanese Mint, shows that the high standard of excellence of the work done at this establishment is still kept up. Rather more gold was coined than during the previous year, viz. 803,645 yen, all in 5 yen pieces; the silver coined during this year was all 1 yen pieces, and amounted to 3,294,988 yen; whilst the nominal value of the copper coins, in 2 sen, 1 sen, and half sen pieces was 1,130,548 yen. The total nominal value of the coins of all denominations struck since the commencement of the Mint to the end of the last financial year is 102,888,478 yen, of which more than one-half is gold and two-fifths silver. Besides this a large number of medals have been struck and refined ingots produced. This year a large number of old bronze guns and field pieces have been melted down, refined, and converted into copper coins, and also additional improvements and economies have been made in the treatment of old Japanese silver coins prior to their re-coining. The sulphuric acid works in connection with the Mint have been more busy than last year, and nearly a million pounds of acid have been exported to China in addition to that produced for home consumption. The soda works are now in working order, and a considerable outturn of sulphate, black ash, white ash, and crystallised soda has been made; caustic and bicarbonate of soda will shortly be produced, and it is proposed to add works for the production of bleaching powder so as to utilise the whole of the hydrochloric acid formed. There was a considerable increase in the amount of Korean gold dust received during the year, but it was not generally of a high standard. The curve showing the variation in weight of the silver yen issued, as also the report of the trial of the pyx and the reports of the assays on the pyx pieces made by Prof. Chandler Roberts of the Mint in this country, and by Mr. Lawner, of the American Mint, show that the greatest care and attention is given to every department, both by the foreign *employés*, Mr. Wm. Gowland, chemist, assayer, and technical adviser, and Mr. R. MacLagan, engineer, and also by the native officials. The report affords abundant evidence that excellent work is being done by the above-named European technical advisers of the Japanese Government.

WE have received an excellent little pamphlet on "The Rudiments of Cookery, with some Account of Food and its Uses." It is called a manual for the use of schools and homes; is written by "A. C. M.," examiner to the Northern Union of Training Schools for Cookery, dedicated to the Countess of Derby, and published by Simpkin and Marshall. Besides conveying practical information on plain cookery, the writer is careful throughout to explain the why and the wherefore of every point by briefly stating the principles of elementary science which bear upon the subject. We can recommend the pamphlet to the "schools and homes" for whose use it is designed.

AT the meeting of the Royal Geographical Society on Monday evening, Sir Henry Rawlinson, who presided, stated that Mr. Leigh Smith, in acknowledgment of the assistance which the Royal Geographical Society had afforded him in fitting out his expedition, and also to mark the extent of the interest he takes in Arctic discovery, had presented 1000*l.* for the purpose of extended Arctic exploration. Sir Henry referred briefly, also, to the recent services of one of the native explorers which the Indian Government are in the habit of sending beyond the Himalayas, which are closed to Europeans by the jealousy of the natives. The paper from which he quoted said: "One of

General Walker's native explorers has returned to India after an absence of four years through Thibet, in which he has obtained a large amount of new geographical information, and has finally disposed of the question of the Sanpo River, which does not, according to him, fall into the Irawaddy, as was generally supposed. The traveller got as far north as Santu, lat. 40° N., 92° E., which is supposed to be the Sorchia of Marco Polo. Returning, he proceeded to Batang, and tried to reach Assam by the direct route, but was stopped at the frontier of the Mishmi country by the assurance that the natives were savages, who would murder him. He, therefore, took a circuitous route to Lhasa, *via* Alanto and Gjamda. But from the latter place he turned and made for Chetang, on the Sanpo, thence by Giangze, Leng, and Phari, to Darjeeling. He reports that Sama is the place where two Europeans coming from Assam were murdered some thirty years ago. If so, it must be Wilcox's Simé, where the priests Kirch and Bsuray were murdered in 1854. He is positive he only crossed the Sanpo once at Chetang. He says that on the road from Sama to Gjamda there is a great range of hills to the west, separating the basin of the affluents of the Sanpo, from that of the affluents of the Irawaddy to the east."

LIEUT.-COL. BERESFORD LOVETT, her Majesty's Consul at Astrabad, read at the same meeting a paper, which was illustrated by an itinerary map from his plane table survey of four inches to the mile. The route from Teheran northwards to Asolat is well known, but new ground was traversed between Asolat and the Lur Valley, on the south of Mount Damavand, and again between the Horas River and Firnshuh, and onward to Kurrand, and also between Fulhad Mahala and Shu Kuh. The survey throws considerable light on the untrodden parts of the Elburz Mountains, and on the entire route no part of which had been previously delineated with any approach to accuracy. The author's route was from Teheran to Astrabad, *via* Ahar to Sarak, thence to Husan Ikdir, Gutchisir, Wohbad, Towar, and Arsmkern. The route was along the ridge of the Shamran mountain country, which runs south of the Caspian, the author desiring, as the journey was made in the middle of the summer heats, not to descend below 5000 feet, while on the journey an altitude of over 9000 feet was attained, and one mountain 12,500 feet was measured and ascended. The author found in one position a plateau of considerable height full of oyster shells, while in his paper and in the discussion which followed, it was shown that at one geological period the Caspian must have been a sea of very large extent to the north and east.

UNDER the presidency of the Marquis of Exeter, a National Fish Culture Association has been established, its object being to increase the supply of food by increasing the supply of fish of all kinds.

FROM the preliminary report of the Princeton Scientific Expedition (the third of its kind), whose ground was Wyoming, Colorado, and the west, it would seem that the students who formed the party covered a very considerable field, did some good work in geology and natural history, and endured just enough of hardship to give them the feeling of real explorers.

THE trial of the electro-magnetic engine, aerial screw, and bichromate elements constructed by MM. Tissandier for their directing balloon took place in their aeronautical work-shop at Point du Tour, on January 26, before a large number of electricians and aeronauts. It was shown that the twenty-four elements, each of which weighs about six kilogrammes, give during almost three hours a current which rotates a screw of 2.85m. diameter, and about 5 metres of path, with a velocity of 150 turns in a minute. The motive power really developed may be estimated at that of four horses per hour. The weight of all

the machinery and elements is a little less than 250 kilogrammes. The real effect on the air can only be found by experiments in the air, but according to measurements taken with a dynamometer of the horizontal tendency to motion, it is about the same as in the experiment tried by Dupuy de Lome. The motive power of Dupuy de Lome having been obtained with eight men working his large screw, whose diameter was 9 metres, it may be inferred that the results in the present case will be more advantageous in the ratio of *two and a half to one*. These results are not very powerful when compared with the immense power of aerial currents. But MM. Tissandier have no intention of directing their balloon against strong winds. Their object is to organise an apparatus with which rational experiments may be made in the air, and they have taken advantage of the most recent improvements of science. If their elongated balloon answer their wishes, a real advance will be registered in the history of aeronautics.

EXCAVATIONS are being carried out on Blackheath for the purpose of exposing the "deneholes" which have puzzled geologists and archaeologists, and of which we gave some account in vol. xxiii. p. 365.

In 1884 a general Italian exhibition will be opened at Turin. Among the exhibits will be works in mathematics, physics, and general chemistry.

THE "Treatise on Marine Surveying," reviewed in last week's NATURE, is published by Messrs. Macmillan and Co., and not by Mr. Murray.

THE additions to the Zoological Society's Gardens during the past week include a Mona Monkey (*Cercopithecus mona* ♀) from West Africa, presented by Mr. J. N. Flatau; a Crested Porcupine (*Hystrix cristatus*) from West Africa, presented by Mr. Joseph J. Dove; two Pileated Jays (*Cyanocorax pileatus*) from La Plata, presented by Capt. Gamble; two Grey-breasted Parrakeets (*Bolborhynchus monachus*) from the Argentine Republic, presented by Mr. Tomas Peacock; an European Tree Frog (*Hyla arborea*), European, presented by Mrs. M. B. Manuel; a Malbrouck Monkey (*Cercopithecus cynosurus* ♂) from East Africa, a Macaque Monkey (*Macacus cynomolgus* ♀) from India, deposited; a Water Chevrotain (*Hyomoscius aquaticus*), born in the Gardens.

OUR ASTRONOMICAL COLUMN

VARIABLE STARS.—The following are Greenwich times of heliocentric minima of Algol:—

	h. m.		h. m.
February 3,	8 47	Feb. 26,	7 18
17,	16 52	March 12,	15 23
20,	13 41	15,	12 12
23,	10 29	18,	9 1

The light equation (geocentric—heliocentric) in seconds, may be found from the expression—

$$460 \cdot 2s. R. \sin (S + 35^\circ 28' 7''),$$

where R is the earth's radius-vector, and S the longitude of the sun. S Cancri will be at a minimum about the following times:—February 2, at 9h. 40m.; February 21, at 8h. 55m.; and March 12, at 8h. 2m. A minimum of U Cephei occurs on February 5, about 13h. 26m. χ Cygni is at minimum on March 17. This year's maximum of Mira Ceti is not observable. According to the observations of Mr. Knott in 1881 and 1882, a maximum of T Cephei, when the star is about 6.5m., may be expected towards February 17; the position of this variable for 1880 is in R.A. 21h. 7m. 57s., Decl. $+68^\circ 0' 1''$; it is No. 3731 in Fe Lorenko's catalogue from Lalande.

REPORTED DISCOVERY OF A COMET.—A Reuter's telegram from Puebla, Mexico, January 23, states that a comet had been discovered there near the planet Jupiter, of which no further account has been received at the time we write, nor has a some-

what hurried examination of the vicinity between clouds revealed anything brighter or more cometary in aspect than our very old friend, the first nebula of Messier's catalogue near ζ Tauri, which has proved "a mare's nest" for more than one incipient comet-hunter. Jupiter was close at hand on January 22, but there was a full moon on that date, which hardly favours the suggested explanation. Messier 1, it may be remembered, led to more than a single false alarm when observers were on the look out for Halley's comet in 1835.

THE NEXT RETURN OF D'ARREST'S COMET.—At the sitting of the Paris Academy of Sciences on January 22, M. Leveau communicated elements of the orbit of D'Arrest's comet of short period, for the approaching return to perihelion. He states that on account of the great perturbations suffered by the comet from its passage near Jupiter during the period 1859-1863 (in April, 1861, it passed within 0.36 of the earth's mean distance from the planet), and the want of observations at its third appearance in 1864, it has not been possible to combine in the same system of elements the observations made in 1851 and 1857 with those of 1870 and 1877. He has consequently been obliged to determine the osculating orbit in 1883, from the elements which best represent the observations of 1870 and 1877 alone. The following are the elements of the comet's orbit for 1883, June 12.0, M.T. at Paris:—

Mean anomaly	328 13 20.3	
Longitude of perihelion	319 11 10.8	} Mean
" ascending node	146 7 21.0	
Inclination	15 41 47.1	} 1880.0
Angle of eccentricity	38 46 33.4	
Mean daily sidereal motion	530.65245	

It is M. Leveau's intention to prepare and circulate among astronomers an ephemeris for what appears to be the most likely period during which to obtain observations, or from April 23 to November 25 in the present year, but from the comet's great distance or unfavourable position it is probable that only the largest telescopes will command it. By the above elements the comet will not arrive at perihelion until 1884, January 13.5765 Greenwich M.T.

MERIDIAN OBSERVATIONS OF NEBULÆ.—Dr. Engelmann publishes the positions of about 120 nebulae, determined with the 6-inch meridian circle of the Leipsic Observatory, and reduced to the beginning of the year 1870, with the mean epoch of observation and the annual precessions, thus aiding by meridian observations the extension of our knowledge of accurate places of these bodies, which has engaged the attention of d'Arrest, Vogel, Schönfeld, Schultz, and others, with equatorial instruments. Valuable material is thus being collected for the investigation of proper motion amongst the nebulae, which for want of reliable positions in past times, is not practicable at present, except perhaps in a few isolated cases.

ERRATUM.—In last week's "Astronomical Column," p. 300, lines seven and six from bottom, for *Washington* read *Washburn*.

PHYSICAL NOTES

A DOUBLE-ACTION mercury air-pump, invented by Signor Serravalle, who was awarded a gold medal for it at a recent exhibition in Messina, is described in the *Rivista Scientifica-Industriale* (Nos. 21-22). By a simple mechanical method two similar vessels are raised and lowered alternately with each other on opposite sides of a vertical support. A long caoutchouc tube connecting their bottoms lets mercury pass from one to the other. Each has at top a three-way cock; one port of which in a certain position leads into a small open vessel to receive any excess of mercury, and another is connected by means of a caoutchouc tube with a spherical piece fixed laterally about the middle of the vertical support. This piece has three passages, communicating together; two of them are opposite each other, and lead into the tubes from the mercury vessels; the other is connected by tubing to the vessel to be exhausted of air. The three-way cocks at the tops of the vessels are mechanically shifted at the top and bottom of their course by means of a toothed sector and rack in the one case, and a pin and projecting piece in the other.

To observe directly the action of gravity on gases, M. Kraievitch, of the Russian Chemical Society (*Four. de Phys.*,